UNIVERSITY OF JOHANNESBURG
FACULTY OF EDUCATION
NOVEMBER EXAMINATION 2014

PROGRAMME:	B Ed (FET) and PGCE
MODULE:	SUBJECT METHODOLOGY: MATHEMATICS
CODE:	XWI000 AND XWI0001
TIME:	3 hours
MARKS:	200
EXAMINER:	Dr ED Spangenberg
	Prof GJ Jacobs
MODERATOR:	Dr S van Putten (UP)

(This paper consists of 11 pages)

INSTRUCTIONS

Read the following instructions carefully before answering the questions:

1. This question paper consists of **10** questions.
2. Answer **ALL** the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Write legibly and present your work neatly.
5. Read the questions carefully before answering them.
6. Questions may be answered in English or Afrikaans.

QUESTION 1

1.1 Name the four aspects that a personal growth plan (PGP) should address. (4)

1.2 Max Black (1994) argued that "…Mathematics is the study of all structures whose form can be expressed in symbols; it is the grammar of all symbolic systems".

1.2.1 What in your opinion is the nature of Mathematics? (5)

1.2.2 What implications does the nature of Mathematics have on your teaching of Mathematics? (5)

1.3 Distinguish between instrumental and a relational understanding and give an example of each. (6)

(20)

QUESTION 2

2.1 Discuss the six questions that guide lesson planning in Mathematics. (20)

2.2 Which aspects do you consider in organising the year plan for Mathematics? (10)

(30)

QUESTION 3

Curriculum means different things to different people. Most people, including educators equate curriculum with the syllabus.

3.1 How far do you agree with this view? (1)

3.2 Motivate your answer. (2)

3.3 Give a definition for a curriculum. (9)

(12)

QUESTION 4

4.1 The creative act in the Mathematics classroom can be seen as developing in certain phases. Distinguish between these phases. Use examples to illustrate your answer. (18)

4.2 **Use Polya's four steps for problem solving to solve the following problem:**

The length of a rectangle is twice its breadth. The perimeter of the rectangle is 6m. Determine the length and the breadth of the rectangle. Clearly indicate the questions to be asked in each step. (20)

(38)

QUESTION 5

The following questions appeared in a mid-year Gr 11 Algebra examination paper. You are expected to draft an appropriate **answer** (memorandum) for each question. Clearly indicate the *number of marks* that you will allocate to each question, as well as for what each individual mark (in a different colour, if possible) will be awarded (for marking purposes).

5.1 Solve for x: $\frac{1}{x+1} + \frac{2x}{x-1} = 1$

5.2 Solve for x: $x + 2\sqrt{x} - 8 = 0$

5.3 Solve for x: $\frac{7}{x-1} < -2 \; ; \; x \neq 1$

5.4 Calculate: $\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1}$

QUESTION 6

A Gr 11-learner has attempted two of the four problems in the previous question, namely **5.2** and **5.3**. Her suggested answers are portrayed below and in *Annexure A* (at the back of the exam paper). You are expected to mark her answers, in accordance with your memoranda in Question 5. Clearly indicate in **Annexure A** for what each individual mark is allocated and eventually also how many marks she will be awarded for each of her answers. Your completed Annexure A needs to be **returned** with your examination answer sheet.

6.1 The learner's suggested answer to **Question 5.2**

$x + 2\sqrt{x} - 8 = 0$

$2\sqrt{x} = 8 - x$

$4x = 64 - 16x + x^2$

$x^2 - 20x + 64 = 0$

$(x - 4)(x - 16) = 0$

$x = 4 \text{ or } x = 16$

6.2 The learner's suggested answer to **Question 5.3**

$$\frac{7}{x-1} < -2$$

$$7 < -2\,(x-1)$$

$$7 < -2x + 2$$

$$5 < -2\,x$$

$$-5 > 2\,x$$

$$\frac{-5}{2} > x$$

$$x < \frac{-5}{2}$$

Combined marks for Questions 5 and 6: (30)

QUESTION 7

7.1 Explain what the assessment tasks **recording** and **reporting** are and suggest guidelines on *why* and *how* they should be performed in Mathematics. (10)

7.2 Highlight five school-based **principles** of recording and reporting. (5)

(15)

QUESTION 8

Distinguish between an assessment **method**, **tool** and **form** by firstly *defining* each of them and secondly by providing *four examples* of each of them in Mathematics.

(15)

QUESTION 9

Mathematics teachers should be able to **identify the relationship** between answers to a mathematical problem (forthcoming from the learners) and the processes of the generation of learners' suggested answers. Some 'correct' answers might be obtained through incorrect or inappropriate mathematical reasoning.

In 2006, Jill Adler (University of the Witwatersrand) and Zain Davis (University of Cape Town) presented a group of Grade 10 learners with the following equation to solve for x:

$$x^2 - 2x = -1$$

They obtained the following suggested solutions from **five** of the Gr 10 learners.

Learner 1: $x = 1$, because if $x^2 - 2x = -1$, then $x^2 = 2x - 1$ and $x = \sqrt{2x - 1}$. x can't be 0 because we get 0 = $\sqrt{-1}$. x can't be negative because we get the square root of a negative. $x = 1$ works because we get 1 = 1 and no other number bigger than 1 works

Learner 2: $x = 1$, because if $x^2 - 2x = -1$, then $x(x - 2) = -1$ and so $x = -1$ *or* $x - 2 = -1$, which leaves us with $x = 1$ (because $x = -1$ does not hold true)

Learner 3: $x = 1$, because if $x^2 - 2x = -1$, then $x^2 - 2x + 1 = 0$ and this factorises to get $(x - 1)(x - 1) = 0$; so $x = 1$

Learner 4: $x = 1$. I drew the graphs $y = -1$ and $y = x^2 - 2x$. They intersect in only one place, at $x = 1$.

Learner 5: $x = 1$. I substituted a range of values for x in the equation and 1 is the only one that works.

Demonstrate your Mathematics assessment skills by:

9.1 Indicating in respect of each of the five learner solutions whether they are *correct* or *incorrect*. (10)

9.2 Explaining how you would communicate the strengths, limitations, or errors in each of the five suggested solutions to the whole class of Gr 10-learners. Outline the argument that you will use in respect of each solution. (10)

(20)

QUESTION 10

10.1 Three prominent requirements of a good examination paper are **validity**, **reliability** and **standard**. Explain what these three requirements mean, by providing a *working definition* in respect of learner assessment for each of them. (6)

10.2 In **Annexure B** (at the back of the paper) you'll find a Grade 11 Mathematics examination paper. Carefully interrogate the paper and evaluate to what extent it meets the **technical** requirements of a *good paper* by identifying and listing deficiencies in respect of its design, lay-out, consistency and content.

You are expected to number and to mark in colour (or highlight) each potential deficiency that you've identified in the paper (in the Annexure) and also to number and briefly describe them in your answer book.

There are a large number of technical design, lay-out or consistency-related deficiencies, of which you are expected to identify ***seven (7)***. You are also expected to recognise and describe ***seven (7)*** content-related deficiencies.

(14)

(20)

TOTAL: 200

Annexure A can be found on the next page. It is followed by **Annexure B**.

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ANNEXURE A

Your initials and surname: _____ **Student number:** _____

This Annexure should be used to answer **Question 6**.
Your completed Annexure must be returned with your answer sheet.

6.1 The learner's suggested answer to **Question 5.2**

$x + 2\sqrt{x} - 8 = 0$

$2\sqrt{x} = 8 - x$

$4x = 64 - 16x + x^2$

$x^2 - 20x + 64 = 0$

$(x - 4)(x - 16) = 0$

$x = 4 \text{ or } x = 16$

6.2 The learner's suggested answer to **Question 5.3**

$\frac{7}{x-1} < -2$

$7 < -2(x - 1)$

$7 < -2x + 2$

$5 < -2x$

$-5 > 2x$

$\frac{-5}{2} > x$

$x < \frac{-5}{2}$

ANNEXURE B

Your initials and surname: _____ **Student number:** _____

This Annexure should be used to answer **Question 10.2**.
Your completed Annexure must be returned with your answer sheet.

GOOD EXAMS COLLEGE

NOVEMBER EXAM 2014

GRADE ELEVEN
MATHEMATICS

PAPER 1

Time: 3 hour Marks: 100

PLEASE READ THE INSTRUCTIONS

1. This exam paper consists of 6 pages, including the cover page.
2. Read the questions carefully and answer them ALL
4. It is in your own interest to write legibly and present your work neatly
5. Pencil will NOT be marked
6. Round-off all answers
6. All the necessary working details must be clearly shown
7. Approved calculators may be used, unless otherwise stated
8. You must cross out work that you do not want marked CLEARLY.
   The marker will only mark your first attempt at answering a question!!

HAND YOUR QUESTION PAPERS IN TOGETHER WITH YOUR ANSWER SHEETS

QUESTION 1

Solve for x, rounding off where necessary:

1.1) x - 2(x - 5) = 10 (4)

1.2) $\sqrt{4+3x}-2+x=0$ (5)

1.3) $xa-b=xb-a$ (3)

1.4) $\frac{x^2-x-2}{1-x}\geq 0$ (5)

1.6) $\frac{x}{3}\leq\frac{3}{x}$ [17]

Question 2

2.1) Determine the nature of the roots of:

$2x^2-3x-1=0$ (2)

2.2) Show that the roots of the equation:

$x^2+2x-15=k(x-3)$ is real for all real values of p. (7)

2.4) $2x^2-7x=b$

a) For which value of b will the roots be real? (4)

b) Give a value of $b, b\in \mathrm{N}$, so that the roots are rational. (2)

Question 3

3.1) $f(x)=mx^3-5x^2-px+6$ is exactly divisible by $(x-2)$

g(x) leaves a remainder of -3 when divided by $(2x-1)$.

Calculate *m* and *q*. (7)

3.2) Solve for $x: 2x^3+7x^2-7x-30=0$ (6)

3.3) Given $f(x)=2x^2+kx+4$ can be expressed as

$f(x)=(x-2).g(x)+6$ determine:

3.3.1.1. the value of *k*. (3)

3.3.1.2. *g(x)* (2)

Simplify the following without the use of a calculator:

4.1 $\frac{5^{x+1}.25^{x-1}}{225^x}$ 4

4.2 $\frac{3\sqrt{-18}-\sqrt{50}}{2\sqrt{72}}$ 6

4.3 $2^{x-1}-2^x=-1/4$ 4

4.4 $3^x + 3^{3-x} = 28$ (5)

Question 5

5.1) $\sqrt{3-x} = 2 + \frac{x}{2}$ is defined only if $-4 \leq y \leq 3$ (4)

5.2) Joseph wants to use a piece of soldering wire, 1/8" thick of tensile strength 180N 18m long is bent to form a rectangular frame for a chicken coop they is building to house the 18 chickens for their family of 8. Help her to determine the length of the rectangle if the area is 14m^2. (6)

Solve for x and *y*:

Bii) $(x-3)^2 + (2y-1)^2 = 0$ (2)

Bib) $2x - 3y = 1 = 2x^2 - 2xy - 3y^2$ (5)

Question 6

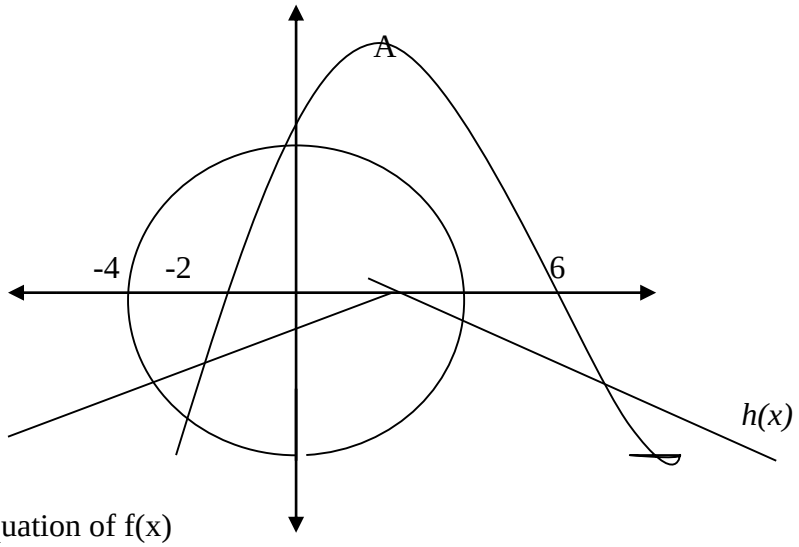
GOOD EXAMS COLLEGE is situated at 10 Downing Street; London. It accepts both day pupils and borders. The fee for a day pupil is R44000 per year and the fee per border is R33000 per year. The total fees must be at least R13 200 000.

Let the number of day pupils be *x* and the number of borders be *y*.

Represent this information in an inequality. (2)

Use the graph paper provided to sketch a feasible region for the problem. (4)

Question 7



Determine the equation of f(x) (2)

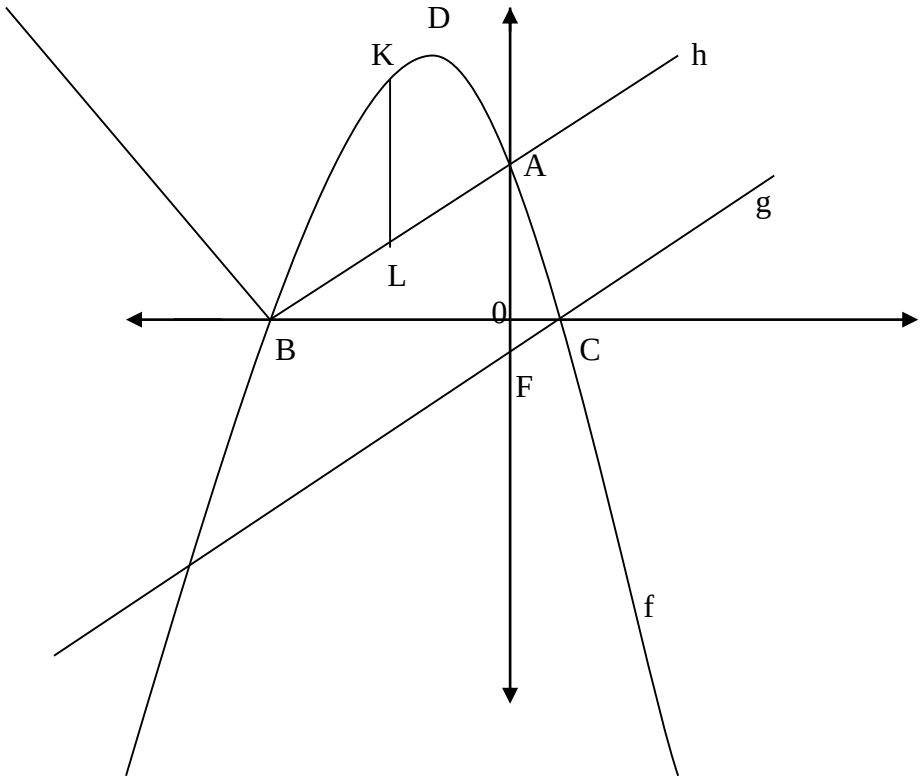
RTP that the equation of the parabola is:

$$y = \frac{1}{3}x^2 + \frac{4}{3}x + 4$$ (4)

f $h(x) = -\frac{1}{2}|x-1|$ give the domain and range of

The shaded area. (7)

Question 8



$f(x) = -x^2 - 2x - 8$

$g(x) = -\frac{1}{2}x + 1$

8.1) Determine the co-ordinates of A,B,C,D,E and F. (14)

8.2) Give the equation for $g^{-1}(x)$ and sketch the graph. (6)

Total: 150